APPLICATION NOTE

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*Indicates those sections where changes have occurred since the last printing.

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Code No. LIT-6375130

Configuring TC-9102 Applications

Introduction

This section provides an overview of the TC-9102 controller applications and their configuration.

This application note describes how to create a new configuration.

Key Concepts

TC-9102 Controller

Overview

The TC-9102 controller is preconfigured for fan coil application. The user cannot modify the sequence. The user selects the types of fan control, heating and cooling valve control, and remote setpoint. The heating and/or cooling valve control types must be the same for both outputs.

The TC-9102 modulates or cycles the heating and cooling valves to control space temperature. The fan speed also modulates or cycles to control space temperature.

For specifications, technical data, actuator, and ordering information, refer to the *TC-9102 Terminal Controller Technical Bulletin (LIT-6363050)* in the *Metasys Application Specific Controllers Technical Manual (FAN 636.3)*.

Configure the TC-9102 controller using HVAC PRO™ (Figure 1).

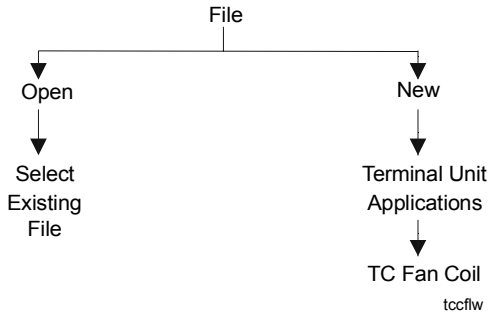

Figure 1: TC-9102 Application Configuration Paths

Terminology

European terminology is used throughout this document. Table 1 provides the equivalent European and North American modes. Table 2 defines some terms used in this manual.

Table 1: European and North American Terminology

European	North American
Comfort	Occupied
Comfort Setpoint Cooling	Occupied Cooling Setpoint
Comfort Setpoint Heating	Occupied Heating Setpoint
Earth	Earth Ground
N2 COM	N2 REF
Night *	Unoccupied
Night Cooling Setpoint Bias *	Unoccupied Cooling Setpoint Bias
Night Heating Setpoint Bias *	Unoccupied Heating Setpoint Bias
Off	Shutdown
Standby	Economy or Temporarily Unoccupied **
Standby Cooling Setpoint Bias	Economy Cooling Setpoint Bias **
Standby Heating Setpoint Bias	Economy Heating Setpoint Bias **
Winter/Summer Compensation	Compensation

* Not available for TC-9102 in Standalone mode; use Standby mode.

** Provides intermediate setpoints for energy savings.

Table 2: Terminology Definitions

Term	Definition
0 to 10 VDC	Proportional
DAT	Duration Adjust Type
PAT	Position Adjust Type (Incremental)
PWM	Pulse Width Modulated (Europe only)
WSP	Working Setpoints
WSP Cooling	Working Setpoint Cooling
WSP Heating	Working Setpoint Heating

Software Configuration Numbers

Figure 2 provides a guide for determining the type of controller, based on the configuration number assigned to it.

For example, a software configuration of TC-9102-0667 is a controller with two heat stages, two cooling stages, a 3-speed fan, and +/-5 setpoint.

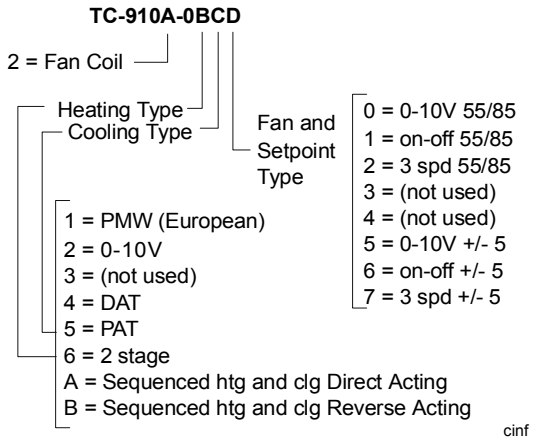
TC-910A-0BCD
2 = Fan Coil
Heating Type
Cooling Type
Fan and Setpoint Type
0 = 0-10V 55/85
1 = on-off 55/85
2 = 3 spd 55/85
3 = (not used)
4 = (not used)
5 = 0-10V +/- 5
6 = on-off +/- 5
7 = 3 spd +/- 5
1 = PMW (European)
2 = 0-10V
3 = (not used)
4 = DAT
5 = PAT
6 = 2 stage
A = Sequenced htg and clg Direct Acting
B = Sequenced htg and clg Reverse Acting
cinf

Figure 2: Software Configuration Numbers

Note: Refer to the *TC-9102 Terminal Controller Technical Bulletin* for hardware configuration.

Description

A fan coil unit controls the temperature of an individual space. Often used in entryways, motel and hospital rooms, and in perimeter zones, fan coil units have a fan, heating and/or cooling coil, and filter. The controller does not provide time-delay requirements for compressors.

In some cases, the fan coil unit has a manually adjustable outside air damper for minimum ventilation requirements. If the unit has an automatic outside air damper, a hardwired fan interlock is required. Or, use either the unit ventilator or rooftop application in a UNT (Unitary Controller) as described in the *UNT Controller* section of the *HVAC PRO User's Manual* (*FAN 637.5*).

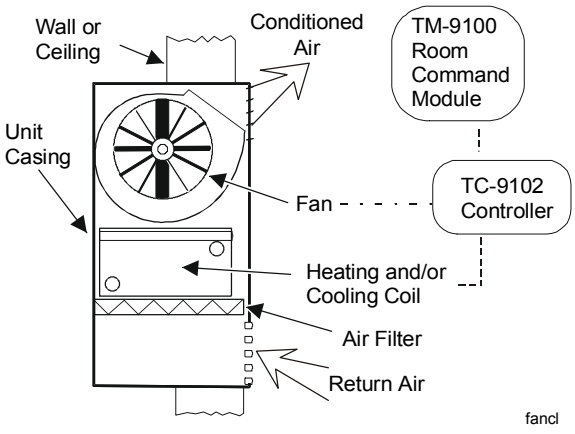

Figure 3: Typical Fan Coil Unit

The controller controls fan coil heating or cooling from a wall-mounted room command module (TM-9100) or from a return-air sensor. Heating and cooling is controlled in sequence to achieve setpoint. If the TM-9100 is mounted inside the fan coil control panel as in a typical hotel-room unit, the sensor must be mounted in the return-air intake.

Note: The TM-9100, a Negative Temperature Coefficient (NTC) sensor, is the only sensor used with the TC-9102 controller.

Systems using hot and chilled water for temperature control may be arranged in a 2-, 3-, or 4-pipe configuration. The TC-9102 applies to the 4-pipe configuration. This configuration requires different numbers of valves and different control sequences. If the fan coil has separate heating and cooling coils, separate valves are used. When a common coil is used for heating and cooling, then use the fan coil application in the UNT controller as described in the *UNT Applications Application Note (LIT-6375100)* in the *HVAC PRO User's Manual* (*FAN 637.5*).

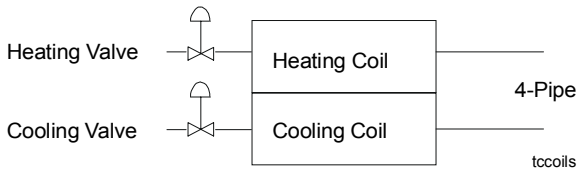

Figure 4: 4-Pipe System Application

N2 Dial Capability Upon Alarm Detection

When the controller is connected to a remote N2 Bus, supervised by a Metasys® Network telephone-linked Metasys N2 Dialer (NU-NDM101-0), the following controller-alarm conditions start an automatic dial:

- window open (not intended for use as a security system)
- Low-Limit mode
- High- or Low-Alarm Limit violation of room temperature when the Supervisory System sets alarm limits

When any of these alarm conditions occurs, the N2 Dialer detects the alarm and connects the remote N2 Bus to the Metasys Network. When the telephone line connection is established, the controller alarm status resets automatically. The controller then reports other alarm conditions as they occur. Refer to the *N2 Dial Application Application Note (LIT-6375150)* in this manual and the *N2 Dialer Module (NDM) Technical Bulletin (LIT-6363065)* in the *Metasys Application Specific Controller Technical Manual* (*FAN 636.3*) for more information.

Control Modes

Standalone Mode

The controller operates in Standalone mode when it is not connected to a Supervisory System via the N2 Bus. In Standalone mode, the controller operates in one of three Control modes:

- Comfort (Occupied): Control at comfort setpoint
- Standby (Temporarily Unoccupied): Control at a standby-level setpoint
- Off (Shutdown): Low-limit temperature control only

The window contact, occupancy sensor, and occupancy inputs set the Control mode and Alternate mode.

The occupancy sensor is any device indicates the presence of people in a space. Occupancy sensors require appropriate time-out circuits to prevent mode cycling. The Occupancy button on the TM-9100 thermostat modifies the Control modes (Table 3). Pressing the Occupancy button toggles between the Control mode and the Alternate mode.

Table 3: Standalone Modes

Window Contact	Occupancy Sensor *	Control Mode	Alternate Mode (Occupancy Button)
Open	Disabled	Off	Disabled
Closed	Closed	Comfort	Standby
	Open	Standby	Comfort

* Status of occupancy in space (Closed = Occupied)

Supervisory Mode

When the controller connects to a Supervisory System via the N2 Bus, it operates in the following modes:

- Comfort (Occupied): Control at comfort setpoint
- Standby (Temporarily Unoccupied): Control at a standby level setpoint
- Off (Shutdown): Low limit temperature control only
- Night (Unoccupied): Control at a night level setpoint

Night is the default control mode.

If the window contact input is open, the controller stays in the Off Control mode, overriding any Supervisory mode or occupancy sensor. Refer to Table 4.

The Supervisory System sets the Control modes. Changing the Supervisory mode overrides the Alternate mode. The occupancy sensor input and the TM-9100 Occupancy button modify the Control modes (Table 4).

The window-contact input switches the controller to the Off Control mode.

The TM-9100 Occupancy button switches the controller operation mode between Alternate mode and Control mode. The Timed-Comfort Alternate mode is active for one hour, non-adjustable, after which the controller returns to the normal Control mode.

Table 4: Supervisory Modes

Window Contact	Supervisory Mode	Occupancy Sensor *	Control Mode	Alternate Mode (Occupancy Button)
Open	Any Mode	Disabled	Off	Disabled
Closed	Off	Closed	Off	Off
		Open	Off	Off
	Night	Closed	Night	Timed Comfort
		Open	Night	Timed Comfort
	Standby	Closed	Standby	Comfort
		Open	Standby	Timed Comfort
	Comfort	Closed	Comfort	Standby
		Open	Standby	Comfort

* Status of occupancy in space (Closed = Occupied)

Manual Modes

When the controller connects to a Supervisory System via the N2 Bus, and that system is set to Manual mode, the controller operates in four modes. Refer to Table 5.

The Manual mode, available from the Supervisory System, disables the occupancy sensor and Occupancy button functions.

Table 5: Manual Modes

Window Contact	Manual Mode	Occupancy Sensor	Control Mode	Alternate Mode (Occupancy Button)
Open	Any Mode	Disabled	Off	Disabled
Closed	Off	Disabled	Off	Disabled
	Night	Disabled	Night	Disabled
	Standby	Disabled	Standby	Disabled
	Comfort	Disabled	Comfort	Disabled

Controller Setpoints

The setpoint in all Control modes may be modified by adjusting the remote setpoint dial on the TM-9100, or from the integrated setpoint adjuster (available only in Europe). The controller models without an integrated setpoint adjuster require that a TM-9100 or an external potentiometer is connected to adjust the setpoint.

When a Supervisory System is connected, the setpoint can be further decreased or increased in the Standby and Night Control mode to further reduce energy requirements during scheduled, unoccupied periods such as nights, weekends, and holidays. The TC-9102 controller does not have a built-in realtime clock.

The controller has two comfort setpoints: comfort setpoint heating and comfort setpoint cooling. The difference between these two values determines the zero energy band where neither heating nor cooling is required.

The controller calculates two Working Setpoints (WSP): WSP heating and WSP cooling. The WSP heating and cooling are the sum of the occupied setpoint values, the remote setpoint value coming from the TM-9100, or the integrated setpoint adjuster (available only in Europe) and the common setpoint value.

In the Supervisory mode, make working setpoint adjustments either by changing the comfort setpoints or by changing the value in the common setpoint parameter of the controller, which enables the Supervisory System operator to adjust the setpoints for heating and cooling at the same time without affecting the zero energy band. In summary:

For the Heating Setpoint calculation, A = B+C+D+E+F, where:

A = Working Setpoint (Heating)

B = Comfort Setpoint (Heating)

C = Remote Setpoint (integrated adjuster available only in Europe or TM-9100 dial)

D = Common Setpoint (Supervisory System)

E = Standby or Night Bias Heating (if mode is active)

F = Winter Compensation (if enabled)

For the Cooling Setpoint calculation, A = B+C+D+E+F, where:

A = Working Setpoint (Cooling)

B = Comfort Setpoint (Cooling)

C = Remote Setpoint (integrated adjuster available only in Europe or TM-9100 dial)

D = Common Setpoint (Supervisory System)

E = Standby or Night Bias Cooling (if mode is active)

F = Summer Compensation (if enabled)

When the room temperature is below the Working Setpoint for heating, the heating output increases according to the proportional band and integral time parameters set for the heating control loop.

When the room temperature is above the Working Setpoint for cooling, the cooling output increases according to the proportional band and integral time parameters set for the cooling control loop.

Low-Limit Mode

The Low-Limit mode is active when the room temperature falls below the low limit setpoint. The Low-Limit mode protects the space and its furnishings from low temperatures. The fan switches on at full speed, and the heating output is set to the maximum level until the room temperature rises by the low limit differential value.

Winter/Summer Compensation

When the controller is connected to a Supervisory System, the Compensation modes are available. Winter/Summer Compensation provides a natural setpoint deviation in response to outside air, to provide energy savings. These modes must be enabled using HVAC PRO. The Supervisory System must provide the outside air temperature value via the N2 Bus through a GPL/JC-BASIC process or Global Data Sharing.

After a power interruption, the Winter and Summer Compensation modes are temporarily disabled until N2 Bus receives a new outdoor air temperature value.

When the outdoor temperature falls below the winter setpoint, the Working Setpoint of the controller is raised or lowered in accordance with the winter authority slope as degrees compensation per degrees outside air temperature (degree per degree).

When the outdoor temperature rises above the summer setpoint, the Working Setpoint of the controller is raised in accordance with the summer authority slope.

Figure 5 shows the effect of the winter and summer compensation on the controller setpoint. The winter/summer authority slope is defined as degree per degree. Heating has a -3°C (-5°F) reset-default limit, and cooling has a 5°C (9°F) reset-default limit.

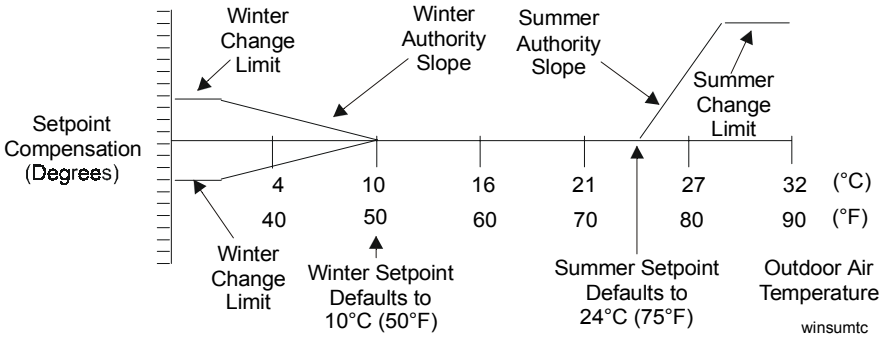

Figure 5: Compensation Effect on the Controller Setpoint

Procedure Overview

Table 6: Configuring TC-9102 Applications

To Do This	Follow These Steps:
Create a New Configuration	In the File menu, select New. Click on the arrow to the right of the Application Group field to display a list of available groups. Use the scroll bar on the side of the drop-down box to see the entire list. Click on Terminal Unit Applications. Double-click on TC Fan Coil to select a TC Fan Coil application. The Question/Answer session begins. Select options in the question/answer session based on the information provided in the *Detailed Procedures* section.

Detailed Procedures

Creating a New Configuration

To create a new configuration:

1. In the File menu, select New. The File New/Application Selection dialog box displays all application groups and, once selected, the applications for the application group (Figure 6).

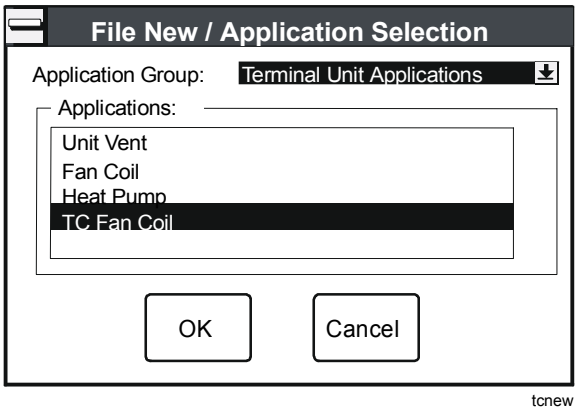

Figure 6: TC-9102 Application Selection Dialog Box

2. Click on the arrow to the right of the Application Group field to display a list of available groups. Use the scroll bar on the side of the drop-down box to see the entire list.
3. Click on Terminal Unit Applications. HVAC PRO automatically displays the list of available applications for the Terminal Unit Applications group.
4. Double-click on TC Fan Coil to select a TC Fan Coil application. The Question/Answer session begins (Figure 7).

5. Select options in the question/answer session based on the information that follows.

WARNING: **Fire hazard or equipment damage.** For 3-speed fan models, interlocked heating and/or cooling are enabled using only HVAC PRO Release 6.03 or later, and only TC-9102 Version 3.0 firmware, or later, supports interlocking. Earlier firmware versions do not support interlocking. Always interlock the 3-speed fan in applications such as electric heat or direct-expansion cooling, both of which require constant air flow over coils. Failure to set interlocking accordingly may result in overheating, fire, or cooling-equipment damage.

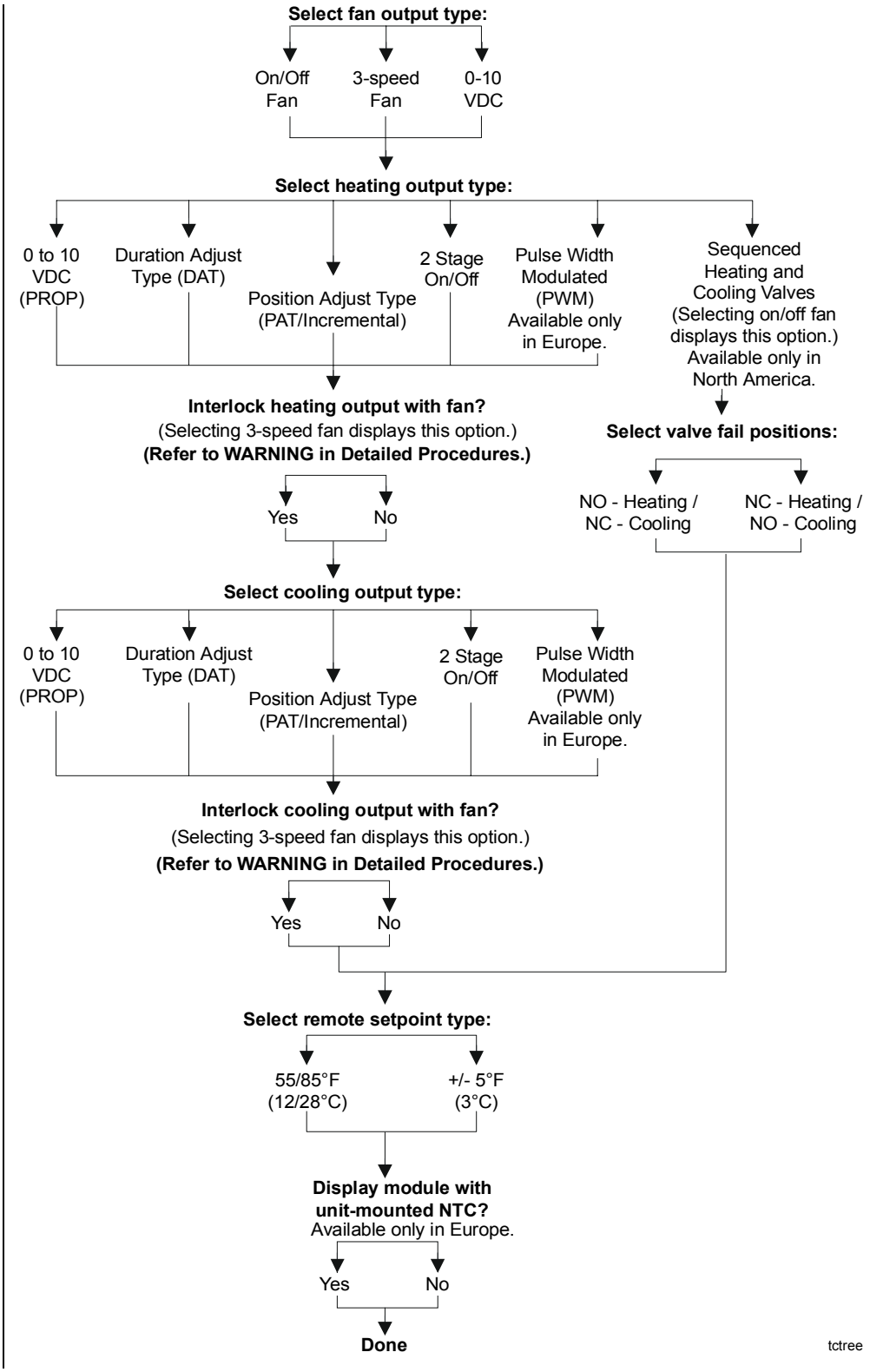
Select fan output type:
On/Off Fan
3-speed Fan
0-10 VDC
Select heating output type:
0 to 10 VDC (PROP)
Duration Adjust Type (DAT)
Position Adjust Type (PAT/Incremental)
2 Stage On/Off
Pulse Width Modulated (PWM) Available only in Europe.
Sequenced Heating and Cooling Valves (Selecting on/off fan displays this option.) Available only in North America.
Interlock heating output with fan?
(Selecting 3-speed fan displays this option.)
(Refer to WARNING in Detailed Procedures.)
Yes
No
Select valve fail positions:
NO - Heating / NC - Cooling
NC - Heating / NO - Cooling
Select cooling output type:
0 to 10 VDC (PROP)
Duration Adjust Type (DAT)
Position Adjust Type (PAT/Incremental)
2 Stage On/Off
Pulse Width Modulated (PWM) Available only in Europe.
Interlock cooling output with fan?
(Selecting 3-speed fan displays this option.)
(Refer to WARNING in Detailed Procedures.)
Yes
No
Select remote setpoint type:
55/85°F (12/28°C)
+/- 5°F (3°C)
Display module with unit-mounted NTC?
Available only in Europe.
Yes
No
Done
tctree

Figure 7: TC-9102 Question/Answer Path

Select Fan Output Type

Choose among the options in Table 7.

Table 7: Select Fan Output Type

Option	Description
On/Off Fan	The On/Off fan control (Figure 8) output is on when: • the room temperature is below the Working Setpoint for heating • the room temperature is above the Working Setpoint for cooling • the room temperature falls below the low limit setpoint The On/Off fan control output is off when: • the room temperature reaches the zero-energy band, when heating or cooling is not required, by the value set for the fan On/Off differential • the controller is set to Off
3-Speed Fan	The fan stages automatically switch in sequence with increasing or decreasing room temperature for 3-speed fan outputs. Speed 1 remains on, in the zero-energy band, around setpoint. See Table 8 and Figure 9. The speed of a 3-speed fan may be set manually from the TM-9100 wall mounted thermostat. The TM-9100 selector switch Off position turns the fan off. In the auto “A” position, the controller sets the speed according to room temperature. In the “1,” “2,” or “3” positions, the fan runs at the selected speed. With TC-9102 firmware Version 3.0 and later, the TM-9100 selector switch is inactive during Night and Standby modes.
0 to 10 VDC	A 0-to-10 VDC output from the controller controls fan speed (Figure 10). The output is a control signal for driving a fan speed controller with a 0 to 10 VDC input. The fan controller provides opto-isolation. As the output voltage increases, the fan speed controller must increase fan speed from fan motor minimum to maximum. When the output is below the voltage required from the minimum speed, the fan must be switched off. The fan runs continuously in the Comfort mode on 0 to 10 VDC models. The 0 to 10 VDC output increases to drive the fan speed controller as the room temperature: • falls below the Working Setpoint for heating • or rises above the Working Setpoint for cooling It maintains a minimum output, set by default at 50%, when the room temperature enters the zero energy band. In Off mode, the fan is off.

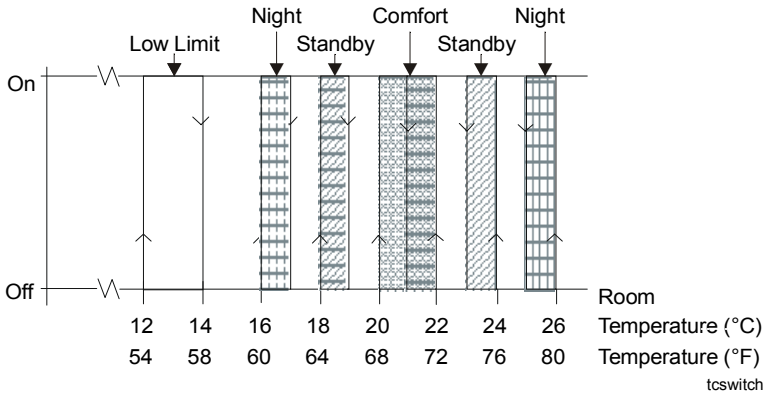

Figure 8: On/Off Fan Control Switch Points

Table 8: On and Off Percentages of Fan Speed

Controller Fan Speed	Heat/Cool On	Heat/Cool Off
1	30	20
2	60	50
3	90	80

Note: Define the minimum fan output to allow the fan to turn off.

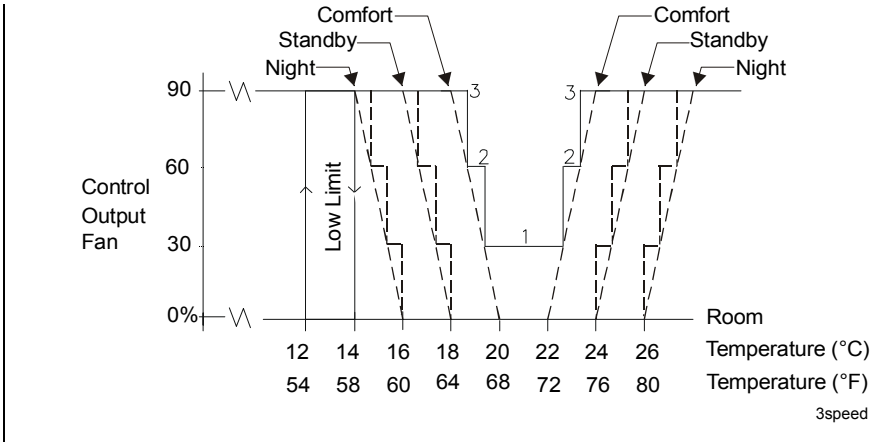

Figure 9: Three Speed Fan Control Switch Points

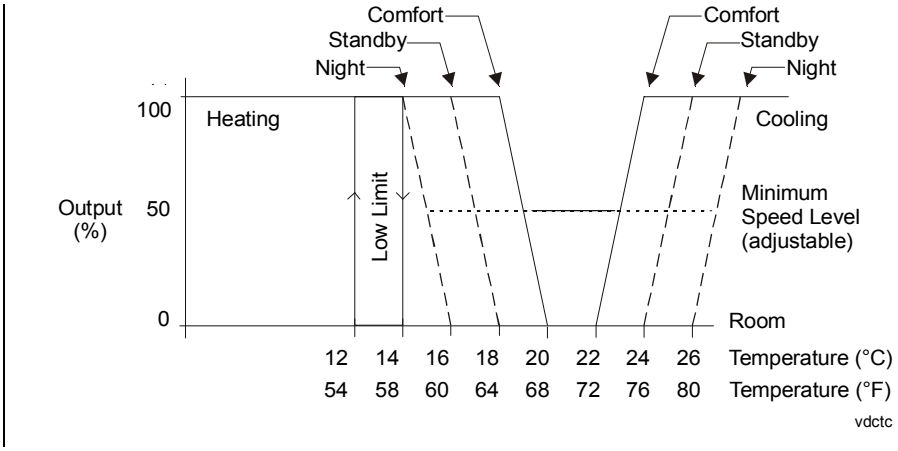

Figure 10: 0 to 10 VDC Fan Control Signal

Select Heating and Cooling Output Types

All heating and cooling output types can be interlocked to 3-speed fan operation. When Interlock functions are selected, the outputs are off when the fan is off. Refer to *Interlock Heating/Cooling with Fan?* in this section.

Choose among the options in Table 9.

Table 9: Select Heating and Cooling Output Types

Option	Description
0 to 10 VDC (PROP)	The output is an analog voltage that varies between 0 and 10 VDC in direct proportion to the controller output from 0 to 100%. The heating/cooling output indicates the output level in heating or cooling, depending on the actual room temperature compared with the Working Setpoints. The Data Definition Language (DDL) generated shows only OCM1 for this output and should be monitored as the heating/cooling control output. While in the Heating mode, an override to the heating/cooling output only affects the heating output. While in the Cooling mode, an override only affects the cooling output. Analog output ranges are fixed at 0 to 10 VDC for 0 to 100% command and cannot be rescaled.
Duration Adjust Type (DAT)	The Duration Adjust Type (DAT) output is a triac switched on for a duration within the set heating and/or cooling valve cycle in direct proportion to the controller output from 0 to 100% (Figure 11). To avoid unnecessary switching of the valve actuator: • the triac remains off when the output is between 0 and 5% • the triac remains on when the output is between 95 and 100% The cycle time is defaulted to 300 seconds.
Position Adjust Type (PAT/Incremental)	The Position Adjust Type (PAT) output is a pair of triacs switched on to open or close an incrementally driven heating and/or cooling valve (Figure 12). The duration of the pulse is based on the change in percent command multiplied by the full stroke time of the actuator. A 100% change will completely open or close the valve. At the 0% or 100% position, the duration of switching increases to ensure that the valve is completely at its end position. Also, the appropriate triac is switched on every two hours for the full stroke time to ensure that the valve remains at its end position. To prevent unnecessary wear on the actuator, the triac output only switches when either: • the output change exceeds 1% in the same direction as the previous change • or, the output change exceeds 2% if the direction of change reverses The full stroke time is defaulted to 60 seconds.
Two Stage On/Off	The two stage on/off output is a pair of triacs switched on in sequence as the controller output increases. 1. The first stage triac switches on when the output exceeds 0%. 2. The second stage triac switches on when the output is equal to the configured load rating, which defaults to 50%. The switching differential is fixed at 5% (Figure 13).

Continued on next page . . .

Option (Cont.)	Description
Pulse Width Modulated (PWM)	This feature is available only in Europe. The output is a high frequency Pulse Width Modulated (PWM) control signal where the width of the pulse varies from 0 to 100% as a controller output function. The heating/cooling output indicates the output level in heating or cooling, depending on the actual room temperature compared with the Working Setpoints. The DDL generated shows only OCM1 for this output and should be monitored as the heating/cooling control output. While in the heating mode, an override to the heating/cooling output only affects the heating output. While in the cooling mode, an override only affects the cooling output.
Sequenced Heating and Cooling Valves	This feature is available only with On/Off Fan selected. Select this function if the system is so equipped.
Select Valve Fail Positions	This feature, available only with *Sequenced Heating and Cooling Valves* selected, sets the default valve-fail positions for sequenced valves. Figure 14 and Figure 15 show the valve functions for each fail position. **NO - Heating/NC - Cooling** The output is an analog voltage that varies between 0 and 10 VDC in direct proportion to the controller output from 0 to 100% (Figure 14). The heating and cooling output modulates from 5 to 0 VDC as the space temperature drops below the heating Working Setpoint and modulates from 5 to 10 VDC as the space temperature rises above the cooling Working Setpoint. The Data Definition Language (DDL) generated shows the common output OCM5 for this output and should be monitored as the heating/cooling control output. At 50%, both heating and cooling are off. **NC - Heating/NO - Cooling** The output is an analog voltage that varies between 0 and 10 VDC in direct proportion to the controller output from 0 to 100% (Figure 15). The heating and cooling output modulates from 5 to 10 VDC as the space temperature drops below the heating Working Setpoint and modulates from 5 to 0 VDC as the space temperature rises above the cooling Working Setpoint. The Data Definition Language (DDL) generated shows the common output OCM5 for this output and should be monitored as the heating/cooling control output. At 50%, both heating and cooling are off.

CAUTION: **Equipment damage.** Mechanical equipment using compressors must be equipped with minimum runtime delay relays.

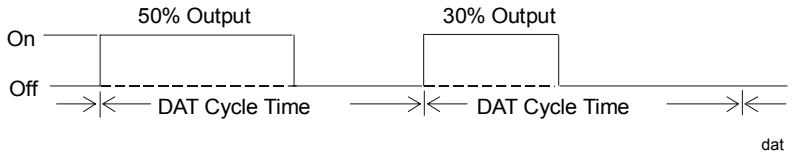

Figure 11: DAT Output

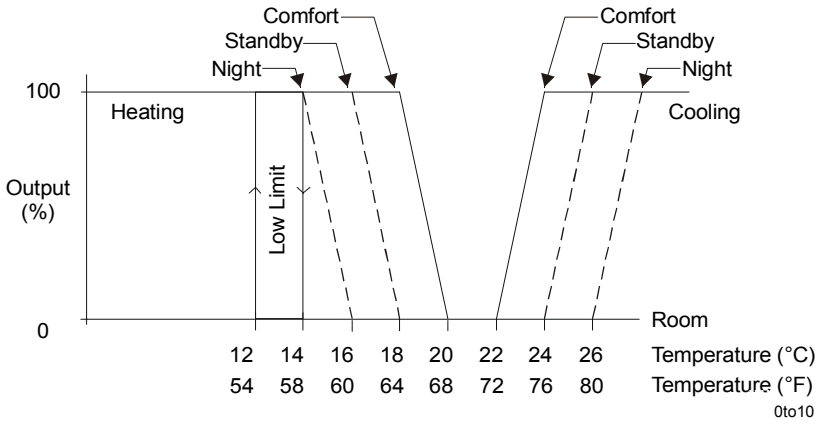

Figure 12: Heating and Cooling Control 0 to 10 VDC, DAT, PAT, and PWM

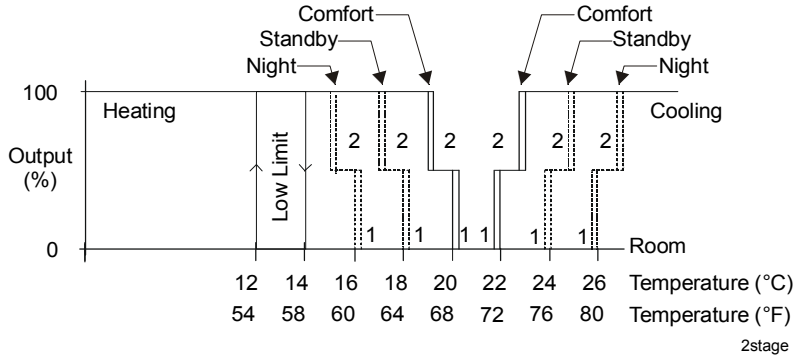

Figure 13: Heating and Cooling Control, Two Stage On/Off

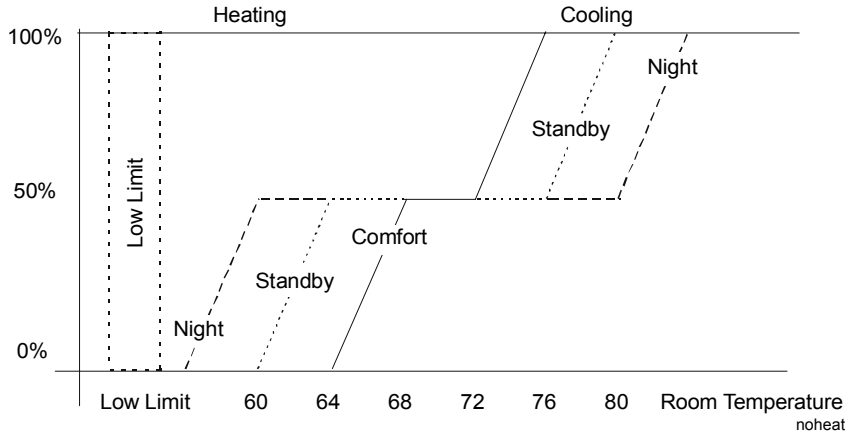

Figure 14: Analog Output 2, Sequenced Heating/Cooling Valves, NO - Heating/NC - Cooling

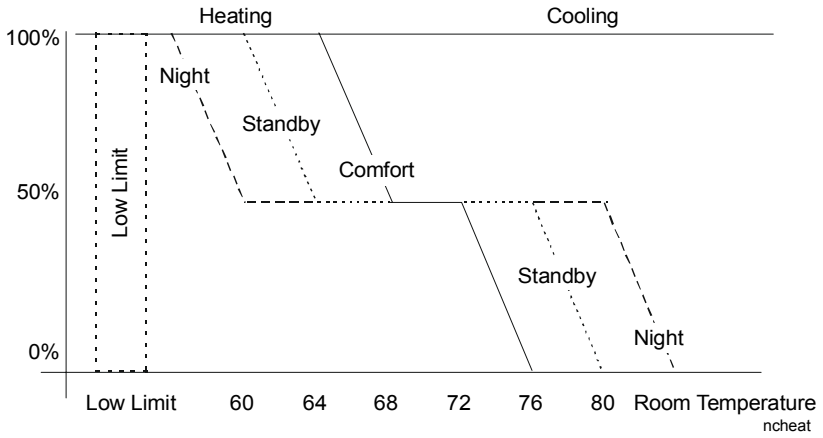

Figure 15: Analog Output 2, Sequenced Heating/Cooling Valves, NC - Heating/NO - Cooling

Interlock Heating/Cooling with Fan?

This function, available only with 3-speed fan selected, switches off the heating and/or cooling when the fan is manually switched to Off at the TM-9100 wall-mount thermostat.

> WARNING: **Fire hazard or equipment damage.** For 3-speed fan models, interlocked heating and/or cooling are enabled using only HVAC PRO Release 6.03 or later, and only TC-9102 Version 3.0 firmware, or later, supports interlocking. Earlier firmware versions do not support interlocking. Always interlock the 3-speed fan in applications such as electric heat or direct-expansion cooling, both of which require constant air flow over coils. Failure to set interlocking accordingly may result in overheating, fire, or cooling-equipment damage.

Choose among the options in Table 10.

Table 10: Interlock Heating/Cooling with Fan?

Option	Description
Yes	This option turns off the heating and cooling outputs when the fan is off.
No	This option allows the heating and cooling outputs to remain on when the fan is off.

Select Remote Setpoint Type

Choose among the options in Table 11.

Table 11: Select Remote Setpoint Type

Option	Description
12 to 28°C (55 to 85°F)	This selection sets the controller parameters to allow the integrated setpoint adjuster (available only in Europe) or TM-9100 remote setpoint dial to adjust the controller setpoint up and down. Read and learn the *Controller Setpoints* topic in the *Key Concepts* section of this technical bulletin for an explanation of how the Working Setpoint is calculated.
-/+ 3°C (5°F)	This selection sets the controller parameters to allow the integrated setpoint adjuster (available only in Europe) or TM-9100 remote setpoint dial to adjust the setpoint up and down from the current setpoint loaded into the controller. Read and learn the *Controller Setpoints* topic in the *Key Concepts* section of this technical bulletin for an explanation of how the Working Setpoint is calculated.

Display Module with Unit Mounted NTC?

Note: This feature is available only in Europe.

Choose among the options in Table 12.

Table 12: Display Module with Unit Mounted NTC?

Option	Description
Yes	Select this option when the controller has a TM-9180 Display Module but a locally wired, unit-mounted NTC sensor reads the temperature.
No	Select this option when the controller has a TM-9180 Display Module and the display module reads the temperature, or when a TM-9100 series thermostat is connected, or if only a unit-mounted sensor is used without a TM-9100.

Troubleshooting

The following concerns a problem that may occur when changing the Night Bias Heating parameter.

Table 13: Troubleshooting TC-9102 Controllers

Error/Condition	Problem	Solution
Change in Night Bias Heating Parameter Causes Heating Output to Remain On	Changing the TC-9102 controller Night Bias Heating parameter from its default value may cause the heating output to remain on when the fan is off. In electric heat applications, air flow is required to avoid overheating. This condition affects all TC-9102 controllers using HVAC PRO prior to Release 6.04.	Ensure that the Night Bias Heating default value remains set to -4°C (-8.00°F) on all TC-9102 controllers. HVAC PRO Release 6.04 eliminates this condition for all Night Bias Heating parameter values.

Attributes and Parameters

Fan Coil I/O Points

The TC-9102 fan coil input and output point types, indexes, names, and descriptions are described below (Table 14).

Note: Table 14 and Table 15 should assign possibilities depending on configuration during the Question and Answer session.

Table 14: TC-9102 Fan Coil Default Point Assignments

Type	Number	Longname
Analog Inputs	AI 1	Room Temp
	AI 2	Remote Setpoint
	AI 2	Warmer Cooler Adjust
	AI 4	Override Input
Binary Inputs	BI 1	Window Contact
	BI 2	Occupancy Sensor
Analog Outputs	AO 1	Htg/Clg Output
	AO 1	Htg/Clg Output PWM
	AO 3	Control Output Fan
Binary Outputs	BO 1	Heating DAT
	BO 1	Htg Vlv PAT Open
	BO 1	Heating Stage 1
	BO 2	Fan
	BO 2	Htg Vlv PAT Close
	BO 2	Heating Stage 2
	BO 3	Heating DAT
	BO 3	Htg Vlv PAT Open
	BO 3	Heating Stage 1
	BO 3	Cooling DAT
	BO 3	Clg Vlv PAT Open
	BO 3	Cooling Stage 1
	BO 4	Htg Vlv PAT Close
	BO 4	Heating Stage 2
	BO 4	Clg Vlv PAT Close
	BO 4	Cooling Stage 2
	BO 5	Fan (Speed 1)
	BO 5	Cooling DAT
	BO 5	Clg Vlv PAT Open
	BO 5	Cooling Stage 1
	BO 6	Fan (Speed 2)
	BO 6	Clg Vlv PAT Close
	BO 6	Cooling Stage 2
	BO 7	Fan (Speed 3)

Fan Coil Parameters

The TC-9102 fan coil parameter point locations, default values, and descriptions are outlined below (Table 15).

Table 15: TC-9102 Fan Coil Default Parameter Assignment and Related Features

Longname	Hardware Reference	Default Value	Description
Supv. Requested Mode	MODC	0 = Night	Supervisory Mode 0 = Night, 1 = Standby 2 = Comfort 3 = Off
Supv. Manual Mode	MAN	0 = Off	Supervisory Manual Mode (locks out mode button)
Operating Status	MODS	0 = Night	Mode 0 = Night 1 = Standby 2 = Comfort 3 = Off
Alternate Mode	MODA	0 = Off	Mode button from TM-9100 active
Low Limit Mode	AFM	0 = Off	Low Limit mode
Low Limit Setpoint	xxxx	12.0°C (54.0°F)	Low Limit setpoint
Low Limit Differential	xxxx	2.0°C (4.0°F)	Low Limit differential
Winter Compensation	xxxx	0 = Off	Winter compensation
Winter Setpoint	xxxx	10.0°C (50.0°F)	Winter compensation setpoint
Winter Authority Slope	xxxx	-0.1 Deg/Deg	Winter compensation authority slope
Winter Comp Limit	xxxx	-3.0 Deg. C (-5.0 Deg. F)	Winter compensation limit Note: This is a Revision 3 (or greater) firmware feature. Controller shows values as unreliable if commissioning Revision 2 or earlier.
Winter WSP Compensation	WAC	Calculated	Winter compensation Working Setpoint
Summer Compensation	xxxx	0 = Disabled	Summer compensation
Summer Setpoint	xxxx	24.0°C (75.0°F)	Summer compensation setpoint
Summer Authority Slope	xxxx	0.2 Deg/Deg	Summer compensation authority slope
Summer Comp Limit	xxxx	5.0 Deg. C (9.0 Deg. F)	Summer compensation limit Note: This is a Revision 3 (or greater) firmware feature. Controller shows values as unreliable if commissioning Revision 2 or earlier.
Summer WSP Compensation	SAC	Calculated	Summer compensation Working Setpoint
Continued on next page . . .			

Longname (Cont.)	Hardware Reference	Default Value	Description
Common Setpoint	PM6K1	0.0°C (0.0°F)	Common setpoint for Supervisory System
Set Outdoor Temperature	XAI4	0.0°C (0.0°F)	Common outdoor temperature for Supervisory System
Gain Jumper	xxxx	0 = Normal	Gain jumper status
Integral Action Jumper	xxxx	1 = Zero	Integral action jumper status
WSP Cooling	WSP2	Calculated	Cooling Working Setpoint
Standby Bias Cooling	xxxx	2.0°C (4.0°F)	Cooling standby bias
Night Bias Cooling	xxxx	4.0°C (8.0°F)	Cooling night bias
Integral Time Cooling	xxxx	0.25 Repeats/Minute	Cooling integral in repeats per minute
WSP Heating	WSP1	Calculated	Heating Working Setpoint
Standby Bias Heating	xxxx	-2.0°C (-4.0°F)	Heating standby bias
Night Bias Heating	xxxx	-4.0°C (-8.0°F)	Heating night bias
Integral Time Heating	xxxx	0.25 Repeats/Minute	Heating integral in repeats per minute
Comfort Setpoint Cool	xxxx	1.0°C (2.0°F)	Cooling comfort setpoint (used with 55/85 setpoint type)
Comfort Setpoint Cool	xxxx	22.0°C (72.0°F)	Cooling comfort setpoint (used with +/- setpoint type)
Prop Band Cooling	xxxx	2.0°C (4.0°F)	Cooling prop band
Comfort Setpoint Heat	xxxx	1.0°C (2.0°F)	Heating comfort setpoint (used with 55/85 setpoint type)
Comfort Setpoint Heat	xxxx	20.0°C (68.0°F)	Heating comfort setpoint (used with +/- setpoint type)
Prop Band Heating	xxxx	-2.0°C (-4.0°F)	Heating prop band
Heating Stage 1 Load	xxxx	50.0 Percent	Heating Stage 1 load capacity
Control Output Heating	OCM1	Calculated	Heating control output
Heating Valve Stroke	xxxx	60.0 Seconds	Heating valve stroke time in seconds
Heating Valve Cycle	xxxx	300.0 Seconds	Heating cycle for duration outputs
Cooling Stage 1 Load	xxxx	50.0 Percent	Cooling Stage 1 load capacity
Control Output Cooling	OCM2	Calculated	Cooling control output
Cooling Valve Stroke	xxxx	60.0 Seconds	Cooling valve stroke time in seconds

Continued on next page . . .

Longname (Cont.)	Hardware Reference	Default Value	Description
Cooling Valve Cycle	xxxx	300.0 Seconds	Cooling cycle for duration outputs
Fan Speed Break Point 1	xxxx	30.0 Percent	Fan Speed 1 on point in percent
Fan Speed Break Point 2	xxxx	60.0 Percent	Fan Speed 2 on point in percent
Fan Speed Break Point 3	xxxx	90.0 Percent	Fan Speed 3 on point in percent
Minimum Fan Output	xxxx	31.0 Percent	Fan minimum output for 3-speed fan
Minimum Fan Output	xxxx	50.0 Percent	Fan minimum output for 0-10V fan
Fan On/Off Differential	xxxx	1.0°C (2.0°F)	Fan differential for On/Off fan
Control Output Fan	OCM3	Calculated	Fan control output
Room Temp Filter Const.	xxxx	10.0 Seconds	Room temperature filter constant
Remote SP Filter Const.	xxxx	60.0 Seconds	Remote setpoint filter constant
Zone Temp Hi Alarm Limit	HIA1	30.0°C (86.0°F)	Room temp high alarm limit
Zone Temp Lo Alarm Limit	LOA1	10.0°C (50.0°F)	Room temp low alarm limit
Htg/Clg Output	OCM1	Calculated	Heating and Cooling output - Separate outputs
Htg/Clg Output	OCM5	Calculated	Heating and Cooling output for sequenced valves

Note: “xxxx” is not accessible from a Supervisory System.

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